Music Perception and Cognition


Summary  Previous research suggests that performance on the Musical Nuance Task (NMT) (Heller, Campbell, & Gibson, 1987) begins to level off around the age of ten. Little is known about the effects of extensive musical experience on musical nuance perception. The purpose of this study is to examine the perception of musical nuance in musicians and non-musicians. The Musical Nuance Task consists of 15 examples performed on a single instrument (clarinet, cello, or piano) and 15 examples with mixed instrumentation e.g., clarinet, cello, and piano within one test item. Our underlying hypothesis was that music majors would demonstrate enhanced performance on the Musical Nuance Task compared to those not engaged in music activities. We examined musical nuance in two experiments using the Musical Nuance Task. Experiment one we examined in 353 non-musicians to evaluate psychometric properties. In experiment two participants (32 musicians and 34 non-musicians) listened to a series of three short musical phrases, and determined which one of the three phrases was not like the other two in inflection, dynamics, and/or expression. Overall, results show that the Musical Nuance Task demonstrates high reliability and validity. The development of aural skills such as musical nuance, is essential to musical training and aural working memory processes.  Importance Musical nuance can be defined as, fine grain deviation in pitch, loudness, time, and tone quality in a musical phrase that a performer manipulates to enhance a performance. Nuance is commonly viewed as subtitle qualities that add expressivity to musical utterance. Research indicates that musicians and educators perceive expressive characteristics such as nuance as the most important element of a musical performance (Lindstrom, et al., 2003). It is important for students to be able to mimic a professional tone, articulation, dynamics, and style. Students need to develop aural skills to be able to discriminate stylistic differences, articulation, and tone quality in their own playing to be able to make adjustments accordingly. Aural discrimination of musical nuance allows educators to more accurately assess performances and provide precise feedback for students.

Procedure - We utilized a modified Musical Nuance Task, a 30-item measure which included 15 items of three short musical phrases performed on the same instruments and 15 items of three short musical phrases performed on three different instruments (cello, clarinet, and piano) to evaluate subtle stylistic and fine grain auditory differences. Previous versions of this task have been used to examine speech and musical perception of prosodic cues (Sioberg, 2005). Two of the three performed phrases were considered the “same” in nuance and one was considered “different” in nuance. The participant was to select circle under the phrase that was considered to be “different” in musical nuance.

Findings  In experiment one, the task was evaluated with a sample of 353 participants with little to no previous musical training. The Musical Nuance Task demonstrated good psychometric properties. In experiment two, we compared the performance of musicians (N=32) and non-musicians (N=34) on the measure. Results of an independent samples t-test indicate significantly enhanced performance by musicians compared to non-musicians, t(64)=5.0, p<.01. Thus, the measure may serve as a reliable and valid tool for measuring musical nuance perception.

Implications for Music Education  Music is an aural art form used as a form of communication. A primary goal of music education is to be able to effectively communicate the language. The Musical Nuance Task may serve as a measure to discern whether a student understands the musical language. Applied music instructors should teach students to recognize and discriminate subtle differences in musical
interpretations. Being able to identify musical nuance will allow students and teachers to communicate expressiveness more effectively. Listening experiences that directly contribute to performance may contribute to overall musicality and enhanced musical nuance perception.

Han, Yo-jung. Pennsylvania State University, State College, PA. **Analysis of Verbal Descriptors For Timbre: Based On Conceptual Metaphor Theory**

Verbal descriptions yield important clues to understand our musical concepts, ideas, and experiences. In the cognitive linguistic view, “natural language is a product of the human mind ... not just a system consisting of arbitrary signs” and it is interplayed with “psychological, cultural, social, ecological, and other factors” (Yu, 1998, p. 13). Therefore language about music can serve as a significant indicator of our perception and cognition of music (Saslaw, 1996). When we describe musical parameters such as pitch, loudness, and duration, our verbal descriptions rely far more on metaphor. For example, in western traditions, pitches are conceived of as “high” and “low”. The physical attribute of pitch, called frequency, is not related with the “vertical height” at all. As Froehlich and Cattely (1991) pointed out, the metaphor “height” regarding pitch might drive from the musical notation. According to conceptual metaphor theory, “metaphor is fundamentally conceptual rather than linguistic in nature” (Yu, 1998, p. 14). Kövecses (2010) explained “the linguistic expressions (i.e., ways of talking) make explicit, or are manifestations of, the conceptual metaphors (i.e., ways of thinking)” (p. 7). In other words, through the metaphorical expressions, we can figure out how certain concept is conceptualized. Metaphor entrenched in everyday life is used without conscious effort, but it governs our thought. In this sense, understanding metaphor is a way of understanding our thought and experiences. It has been found that musical parameters such as pitch, duration, and loudness are conceptualized in terms of physical space, bodily motion, and energy (Eitan & Granot, 2006). However, less attention has been given to the examination of the concept of timbre. Therefore the purpose of this study is to understand the way of conceptualizing timbre based on the conceptual metaphor theory. Research questions are as follows. 1. What kind of conceptual domains (metaphors) are used when describing timbre? 2. What is the difference between timbre metaphors and other parameters’ metaphor? 3. How metaphorical statements are connected with musical facts? This study is in progress. Sixty nine adjective descriptors were collected from the following articles: Traube and Bernays (2011) and Štěpánek (2006). Conceptual metaphor theory will serve as my primary tools in this investigation process.

**References:**


Kotsonis, Amy. Florida State University, Tallahassee. Are They Expressive? The Perception of Body Movement in Choral Ensembles

The purpose of this exploratory study was to explore the influence of body movement on perceived expressivity in a choral performance. I investigated how body movement (minimal versus active) affected music majors’ and non music majors’ perceptions of overall expressive performance when the sound remained moderately expressive. The following research questions were asked: (1) Will listeners rate the overall expressivity of performances differently during minimal and active body movement? (2) Are there differences in perceived expressivity between the music experience levels of the participants? (3) Are there differences in what is deemed appropriate body movement for different styles of music?

This study investigated the perceptions of three specific groups: instrumental (n=21) and choral (n=22) music majors, and non-majors (n=23) with approximately equal numbers of males and females (N=66). Two choral pieces of contrasting styles and tempos were chosen. The first selection was In Allen Meinen Taten from Johann Sebastian Bach’s Cantata BWV 97 (mm. 1-12, approximately one minute in length). A recording by the English Baroque Soloists was used for this piece. The second was I Can Tell the World, a traditional spiritual arranged by Moses Hogan (mm. 29-47, approximately one minute in length). A recording by the Jubilate Sacred Singers was used for this piece. These two pieces were chosen because they were composed during two divergent musical time periods (baroque and modern, respectively), had contrasting styles, different tempos, and were both a cappella. Video stimuli for each piece consisted of all choir members moving with either minimal or active body movement. The same audio recordings were paired with both movements conditions. Participants saw one of the two movement conditions for each piece. The 66 observers used a 10-point scale to rate both expressivity of the performance and how appropriate the body movement was. Excerpts were presented in four different orders to balance conceivable order bias. An initial analysis of variance showed no significant effects between excerpt orders or any interactions between excerpt order and other variables, p > .01.

Two separate three-way analyses of variance were calculated with one within-subject variable (composer) and two between subjects variables (college major and movement group). An alpha level of .01 was used for all statistical comparisons.

There was significant difference in expressivity ratings between composers, but not for movement conditions. However, there was a significant interaction between composer and movement condition. Both Hogan excerpts were rated higher than the Bach excerpts, regardless of movement condition. For both composers, however, the excerpt that included the active body movement was rated higher than
the excerpt with minimal movement. There was no difference found between majors in any of the other interactions. The second analysis compared appropriateness of body movement ratings for each excerpt. A significant difference in ratings was found between composers as well as movement condition. The interaction between composer and movement condition was significant, as well as between composer and major. There was no significant main effect between majors or any other interactions of factors. Further study is warranted on the topic of body movement within the choral setting. Other repertoire styles could be investigated as well to see if the appropriateness differs between other selections, such as comparing jazz with Brahms. The conditions of body movement could be exaggerated further by utilizing more than two: perhaps minimal, moderate and active movement conditions would provide a clearer picture on their influence on perceived expressivity. As has been seen in previous studies, movement is a part of expressivity in performance. While this differs from instrument to instrument, and solo versus ensemble, it does affect the audience’s perception of expressivity. By pinpointing the degree to which these movement conditions influence expressivity, this not only enhances a performance, but has pedagogical implications as well. If active body movement proves to be distracting, but minimal movement is not expressive, there may be a balance found between the two.

McCord, Kimberly. Illinois State University, Normal. Improvisational Thinking in a Young Gifted Twelve-Year Old

Can improvisation be taught? If so when should teachers begin? Researchers differ on whether improvisation can be taught to children (Hickey, 2009; Monson, 1996) “In reflecting on their early childhoods, many Jazz artists describe the process by which they acquired an initial base of musical knowledge as one of osmosis.” (Berliner, 1994). This case study investigates a musically gifted twelve-year old involved in an after-school jazz Orff ensemble and her improvisational thinking. She participates in a monthly improvisation group to develop her skills in soloing with the larger Orff group. Using a model developed by Fidlon (2011), the student was stopped during an improvisation and asked to describe what she planned to play next. Research questions were 1) Do gifted children consciously plan improvised solos? 2) Do gifted children qualify as experts and non-expert improvisers?

The student was encouraged to think of unusual uses of instruments, dynamics and expression and was encouraged to create a solo with melodic and rhythmic direction. These are characteristics of improvisations in young, gifted children (Koutsoupidou, & Hargreaves, 2009). Improvisation sessions were videotaped and transcribed. The student improvised on chord changes using Band-in-a-Box software from pieces being prepared in the jazz Orff group. I stopped the accompaniment typically somewhere in the second chorus and asked the question, “What were you planning to play next?” Fidlon’s categories were applied to look for thinking that fit into one of the following categories, 1) No plan; 2) Proximal intentions and 3) Distal intentions. In addition, I looked for evidence of sketch planning (Norgaard, 2008). The student used sketch planning and other types of thinking strategies that expert improvisers used in their improvising.

Mishra, Jennifer. University of Missouri, St. Louis. Studies of Sight Singing Attention: Lyrics v. Melody

The focus of most sight reading research, whether instrumental sight reading or sight singing, has been the accurate production of pitch and/or rhythmic features. Little attention has been given to the feature that distinguishes instrumental sight reading and sight singing: lyrical content. Songs provide a unique
opportunity to investigate differential processing of musical and linguistic information. The common ability to sing, however, does not directly address the question of whether lyrics and melody are independent (a dual task with little interference), integrated into one unit, or partially integrated or associated. By placing melody and lyrics in conflict, a better understanding may emerge of how these features interact.

Experiment 1 The purpose of this experiment was to determine whether musicians, when given a choice, would choose to attend to melody or lyrics when the features were in conflict. Participants (n = 32) were volunteer music education majors enrolled in a required course at a southern university. Participants completed a binary-choice recognition task. The target stimuli were 20 randomly generated, nine-note melodic fragments. The melodic fragments were notated in the treble clef with each pitch presented as a quarter-note. Each pitch was randomly paired with a letter of the musical alphabet (A to G) placed below that pitch in place of lyrical information. Letters were used in place of words to remove semantic meaning from the stimuli. The stimuli were constructed so that letters written in the place of lyrics did not match the pitch name of the notated pitch; the features of melody and lyrics were placed in conflict to determine where attention would be directed. Two test fragments were created for each target stimulus. One test fragment matched the pitches of the target stimulus and one matched the letters of the target stimulus. The test fragments were completed with new randomly generated letters or pitches. Participants viewed each target melodic fragment for two seconds followed by the two test fragments for five seconds. Participants indicated which of the test stimuli was most similar to the target stimulus and were encouraged to guess. Stimuli were counterbalanced so that on half of the trials, the first of the two stimuli matched the letters of the target and on half of the trials the first stimulus matched the notes of the target. Answers were scored as either matching letters or matching melody. The results of a chi-square analysis showed that, when given a choice, musicians focused attention on the melodic material rather than the textual information, X2(1, N = 359) = 207.62, p < .01. When musicians were forced to choose between attending to melodic or textual material, both because of limited time and the forced-choice test, they overwhelmingly chose to attend to melodic material (melody observed N= 316; lyrics observed N = 43).

Experiment 2 The purpose of this experiment was to determine if memory for melody or lyrics would show an asymmetrical effect similar to the preference study described above. Participants (n = 18) were unpaid, volunteer music education majors enrolled in a required course at a southern university. Participants participated in an incidental memory task in which they were presented with 48 randomly generated melodic fragments. They either read the letter sequences written as lyrics below the staff or labelled the notated pitches. In each case, there were both a congruent and an incongruent condition. Participants were tested individually and were instructed to proceed as quickly and accurately as possible, controlling presentation rate by pressing a button to proceed to the next stimulus. Participants then completed a recognition task consisting of stimuli randomly selected from melodies and lyrics from the incidental memory task. The stimuli were presented either as musical notation without lyrics or as a sequence of letters without staff notation. Lures not previously encountered in the incidental memory were also included. Half of the stimuli were presented as originally encountered in the incidental memory task and half in the alternate mode. There were no significant differences in d1 based on category of stimulus for letter [F (1,17) = 1.46, p = 0.24] or pitch [F (1,17) = 0.01, p = 0.91] sequences. There was a significant difference in the d1 for stimuli that had been part of congruent and incongruent stimuli t(17) = -2.60, p < .02. However, the pattern was unexpected. Incongruent stimuli resulted in better memory.
Previous research has found that listener evaluations of ensemble performances vary depending on the expressivity of the conductor’s gestures, even when actual performances are identical. It was the purpose of the present study to test whether this effect of visual information was evident in the evaluation of specific aspects of ensemble performance, articulation and dynamics. We constructed a set of 36 test items in which 4 music excerpts—two featuring a high degree of articulation contrast and two featuring a high degree of dynamic contrast—were performed by a large chamber ensemble. Each excerpt was performed with either a low or high degree of contrast within the target characteristic. Performances were then paired with video of one of four conductors conducting with either a high or low degree of expressive contrast appropriate to the target parameter. Using one of two equivalent test forms, non-music major college students (N = 175) viewed 16 30-second performances and were asked to evaluate the quality of the ensemble’s articulation, dynamics, technique and tempo along with overall expressivity. Results showed significantly higher evaluations for performances featuring high rather than low conducting expressivity regardless of the ensemble’s performance. Evaluations for both articulation and dynamics were strongly and positively correlated with evaluations of overall ensemble expressivity.

In the jazz idiom, improvising soloists generate new and highly stylized musical works in real time. To improvise at high levels skilled jazz musicians acquire and refine cognitive processes that enable them to make decisions with little or no reflection. Without the possibility for reflection or revision, how are experienced jazz players able to consistently produce well-formed, expressive improvised solos? What are the component cognitive processes underpinning this specialized form of creativity, and how much conscious awareness is allotted to the decisions that must be made during performances? To disentangle these processes we sought to manipulate the demands on improvisers’ cognitive resources and observe the effects of these manipulations on their musical output. Experienced jazz pianists (n=25) improvised melodic solos based on the 12-bar blues in four experimental conditions. The conditions varied by key (familiar/unfamiliar) and by task condition (single-/ dual-task). In dual-task conditions, participants improvised while performing an unrelated counting task. MIDI data recorded during these performances was analyzed using a MATLAB application that detects and indexes recurring patterns. Existing theories propose that improvisers use a combination of learned procedures and pre-formed material to generate music while improvising. We predicted that the secondary task would inhibit the insertion of learned fragments, pressuring the improviser to rely on learned procedures. We are currently analyzing the data; complete results will be available by the time of the proposed poster presentation. Though it is premature to draw any conclusions, the trends emerging in the data we have examined so far suggest the potential of this approach to contribute new insights into the cognitive basis for skilled musical improvisation.
In the fall of 2009, a study was conducted with our university marching band. The purpose of this study was to determine the sound-level exposure that students experienced when participating in a university marching band and whether these sound-levels put them at risk for noise-induced hearing loss. National Institute for Occupational Safety and Health standards state that a person should experience no more than 85 decibels averaged over eight hours (100% of a daily dose allowance). Exposure to sound at and above this level is considered hazardous. Participants (N = 81) included musicians (instrumental, n=73) and non-musicians (drum majors, color guard, and dancers, n=8) in a 150-member university marching band. Data was collected using doseBadges, which are small, wireless sound-level meters. Each participant wore a doseBadge attached to their clothing at their shoulder for at least two rehearsals. Results indicated that 100% of the musician participants and 69% of the non-musician participants experienced greater than 100% of their daily sound dose, which places them at risk for noise-induced hearing loss. As disturbing as the previous information is, all instrumentalists participating in the marching band received sound-level averages that would equate to between sixteen and ninety-seven days worth of sound in one four-hour rehearsal.

As a result of these findings the music department and university administrators had to work together to develop a plan of action for students participating in the marching band. In the fall of 2010, a Health and Wellness proposal was submitted to the administration which recommended that all students who participate in the university marching band wear musician earplugs in rehearsals and performances. It was recommended that the University provide the musician earplugs for every member in the university marching band including directors and assistants. For the past 4 years, every marching band member has been provided a pair of ETY Plugs to wear during rehearsals and performances. At the beginning of each season students are instructed how to insert the earplugs correctly and given an explanation as to why they need to wear them. Initially, the students have been excited about the use of earplugs; however, the marching band directors have noticed that after the first couple of weeks, the number of students who actually wear the earplugs diminishes greatly. Our next step in this process is to administer a survey to marching band members to determine why they do or do not wear earplugs. This survey will be completed with the students in the fall of 2013.

Oliver, Holly. Plymouth State University, Plymouth, NH. How Do Undergraduate Music Education Students Construct the Meaning of Health?

There has been very little attention given to research efforts focusing on the overall health and well-being of undergraduate music education students. Injury prevention and professional burnout and stress appear to be the only foci of such research. In this study, I intend to investigate and interpret how music education students construct the meaning of health and how that meaning shapes and is shaped by an undergraduate music education program. The elements of the music education program that will be explored include the curriculum, related program and performance expectations, and the multiple socio-cultural influences that exist within the music education community (students and faculty). For the purposes of this study, the following health behaviors will be explored: physical activity, nutrition, sleep, and voice care. In addition, physical health, psychological health, mental health, and social well-being associated with the aforementioned health behaviors will also be examined.

The physical body today is biologically determined and socioculturally constructed. The meanings ascribed to the ideal cultural self are continually emerging and subject to the historical, social, and cultural influences of today’s society. Dominant discourse in Western society defines the body as that which can be manipulated by PA, or lack thereof, nutrition, sleep, and voice care. Lifestyle behaviors
that contribute to the bodily expression of self are influenced by the sociocultural meanings given to a healthy and happy body.

Music education majors, just as other college students, react to the meanings defined by the dominant discourse with subsequent behavioral health choices. However, there may be additional or underlying meanings that are constructed by the community in which the music education students live and the degree program in which they are enrolled.

The National Association of Schools of Music (NASM) is the national accrediting body for college music programs. In their 2012-2013 handbook, health is addressed in the music education guidelines in terms of what music educations students should know about injury prevention and professional burnout. Without any mention in the NASM handbook about overall health and well-being beyond injury prevention and burnout, researchers are not motivated to study any other health issues and yet PA, nutrition, sleep, voice care, and accompanying sociocultural influences have a profound effect on the life of the undergraduate music education student. It is my hope that the findings of this dissertation will expand the field of research to include the relationships between undergraduate music education students and their overall health and well-being.

In this dissertation, I will be using a social ecological model grounded in social constructionism as a way to look beyond the individual students in the program and examine the ways in which their environment (social and physical) and cultural worlds influence the meanings around health as well as their associated health behaviors. Social Constructionism will serve as the theoretical framework and the Social Ecological Model of Behavior will be utilized to examine intrapersonal and external influences on health behavior.

Narrative inquiry will constitute the methodological approach for this study. Six to ten undergraduate music education students will be interviewed individually using an open-ended question format. Interviews will be transcribed and participants will be given the opportunity to review transcriptions for accuracy before a thematic analysis is conducted.

In conclusion, it is my hope that research results can be utilized to shape future curriculum reform efforts that provide alternative constructions of health and fully embed a health promoting culture within a music education community.

Orman, Evelyn K. Louisiana State University, Baton Rouge. **Characteristics of High Frequency Heart Rate Variability and Brain Wave Measures During Music Listening**

Crucial to any successful music education environment is musical engagement and response. While the type and level of engagement and response is often debated, the fact that these components must be present is not. Music, as one of the arts, generally seeks a level of engagement adequate enough to elicit an emotional and/or intellectual response. Although overt participation in musical activities may provide music educators with direct measureable outcomes of engagement, levels of engagement can be obscured during activities such as music listening. For years psychophysicologists, music therapists, and other researchers have taken physiological measures in an attempt to ascertain levels of engagement and response during music listening (see Dainow, 1977; Hodges, 2010). One such measure that may be under researched is heart rate variability. Chemicals secreted by the sympathetic and parasympathetic nerves cause fluctuations in the duration of time between spikes in the bioelectrical signal generated by electrical activity of the beating heart (Fitzgerald, Wilson, & Iaizzo, 2005). Changes in
this interval of time, known as heart rate variability, provide several metrics used to determine the different influences of this autonomic branch of the central nervous system.

Fluctuations in High Frequency (HF, 0.15 – 0.4 Hz) Heart Rate Variability (HRV) have been related to emotional responding with increases associated with calm emotional states and decreases associated with high arousal and negative emotional states (Applehans & Luecken, 2006; Gladwell et al., 2012; Hughes & Stoney, 2000; Koole, 2009; Porges, 1991, 1992; Rainville, Bechara, Naqvi, & Damasio, 2006; Thayer & Lane, 2000; Weber, Van der Molen, & Molenaar, 1994). Although, cognitive psychologists have also shown that decreases in the HF HRV measure compared to baseline suggest an occurrence of increased attention, mental effort, cognitive engagement, and mental load (Boutcher, Nugent, McLaren, & Weltman, 1998; Gianaros, Van Der Veen, & Jennings, 2004; Hjortskov et al., 2004; Mathewson et al., 2010; Mulder, 1985; Richards & Casey, 1991; Tharion, Parthasarathy, & Neelakantan, 2009; Weber, van der Molen, & Molenaar, 1994). In fact, both research and reviews of research readily accept HF HRV as a dependent measure of increased attention, mental effort, cognitive engagement, and mental load (Potter & Bolls, 2012; Prinzel et al., 2003).

Electrical activity in the prefrontal cortex, commonly measured by an electroencephalogram (EEG) has been considered a means for assessing cognitive engagement. Alpha (α) brainwaves, ranging from 8-12 Hz, generally reflect relaxed consciousness; beta (β) brainwaves, ranging from 12-30 Hz, generally reflect focused and alert thinking; and gamma (γ) brainwaves, ranging from 30-50 Hz, generally reflect higher mental activity including memory consolidation (Baars & Gage, 2010; Dolce & Waldeier, 1974). Prefrontal cortex activity has been directly related to attention and memory (Jansma, Ramsey, de Zwart, van Gelderen & Duyn, 2007).

If decreases in the HF HRV measure during music listening are indeed a measure of cognitive engagement, it seems reasonable that there might be a correlational relationship among the HRV measure and brainwave activity in the prefrontal cortex. Therefore, this investigation examined correlational relationships between high frequency heart rate variability and alpha, beta, and gamma brainwave measures during music listening.

Thirty-three music education majors listened to three 2 minute and 20 second excerpts; one by Vivaldi, one by Mahler, and one by Ives. Heart rate variability and alpha, beta, and gamma brainwave measures were gathered during all listening. Results showed that when HF HRV movement indicated decreased cognitive engagement, all brainwave measures showed decrease cognitive engagement. When the HF HRV demonstrated an increase in cognitive engagement, all brainwave measures indicated an increase in cognitive engagement. Two-thirds of these measures were significant correlations for the Vivaldi selection. Mean movement for beta brainwaves was the most closely aligned brainwave with mean movement of HF HRV measures. Participants with a high resting HF HRV generally magnified these results while those with lower resting HF HRV did not.

Comprehensive levels of engagement are certainly obscured during music listening tasks. Any progress in the development of a reliable measure of this engagement would advance music education in a variety of ways. It seems that HF HRV measures may be a simple non-invasive means of investigating this engagement level. Findings of this study are encouraging and certainly support future music listening research using heart rate variability as a dependent measure. It is interesting to consider that one day we may be able to ascertain with an acceptable degree of certainty what music is cognitively appropriate at what developmental level for our students and what teaching methods promote meaningful engagement for our students during music listening activities.
Parker, Webb. University of Southern Mississippi, Hattiesburg. The Effect of Metaphoric-Image, Motion, and a Dual Modality Approach on the Perception of Vocal Tone

The use of imagery and movement to affect vocal tone has long been a part of choral pedagogy. These often used, yet little explored tools, are employed by choral directors on all levels. The present study sought to determine if the use of imagery, metaphor, motion, and a combination of the three, as pedagogic tools to affect vocal tone, could be perceived by outline listeners. Three singers - an untrained singer, an undergraduate in choral music education, and a graduate student in vocal performance - were asked to perform a melody under a control and three research conditions: metaphoric-image, motion, dual modality (a combination of metaphoric-image and motion). Participants were randomly assigned to listen to one of the three singers. Participants were asked to rate each condition on tone color, tension, preference, and were directed to ascribe a color to the tone they heard for each condition.

Results indicated that respondents could indeed perceive a difference in tone over the four different conditions. For the metaphoric-image condition, the singers were asked to “sing the line as if it were yellow.” Overall, respondents rated this tone brighter than any others across singers and conditions. The majority of respondents also ascribed yellow to the metaphoric-image tone across singers and conditions. Overall data indicated that respondents perceived the dual modality condition as darkest and most relaxed while the metaphoric-image condition was perceived as brightest and most tense. These results were consistent with the expected pedagogic intent of the conditions as well as the researcher’s hypothesis. A X2 performed on the color ascription data revealed statistical significance in the expectation of response. The data seems to indicate that specific color ascription to vocal tone is consistent across respondents and conditions.

The results of this study are consistent with data found in similar studies examining the effect of imagery on expressive performance. The study’s finding will have an influence on choral methods, rehearsal technique, and choral conducting pedagogies. Seeking to “make the voice tactile,” the study at hand presents empirical evidence as to how using imagery, metaphor, and motion can indeed change the perception of vocal tone. These tools can be used to help students of singing better understand the complexities of the physiological process of singing. They allow conductors a way to increase rehearsal efficiency, increase creative thinking among their ensemble, and connect physiological concepts to a framework of knowledge students already have in place.

Scherber, Ryan. Florida State University, Tallahassee. The Effect of Stimulus Octave on Response Time to Intonation Judgments

The purpose of this study was to determine responses to intonation perception tasks across four stimulus octaves using response time measures. The main objectives of this study were to: (1) Determine rates of correct and incorrect responses between four stimulus octaves, (2) measure and compare the latency (response time) in milliseconds of responses in all four stimulus octaves, (3) determine if latency responses were different based upon direction of pitch deviation, and (4) determine if utilizing response time measures may be a valuable tool in measuring pitch perception. Participants (N=52) in this study were music majors at a large southeastern university. All participants electing to participate responded to twelve pairs of pitches in a paired-comparison format. Tones were computer-generated using Garritan Personal Orchestra software. Brass instrument timbres were
selected due to the presence of complex tones and easy delineation into 4 distinct octave ranges. In each pair, the first note represented an in-tune note and the second note was deviated 0 or 10 cents, both flat and sharp. Each tone represented one range tested in this study: soprano, alto, tenor, and bass (SATB). Experimental tones were designed to be slightly more than just noticeably out-of-tune (more than 5-7 cents.) Participants were asked to identify if the second note was in-tune or out-of-tune and their response time was recorded in milliseconds using the psychological data collection software Inquisit 4.0.3. The custom script prepared by the primary investigator played each of the twelve stimulus sound files and asked participants to rate the second note heard in each pair as “in-tune” or “out-of-tune.” Prior to administering the experiment, participants were asked to read instructions, answer three basic demographic questions: primary instrument/voice type, current degree level or highest obtained, and degree program, and were asked if they had any questions. A three-way Analysis of Variance (ANOVA) with repeated measures was utilized to examine the data. No significant main effects were found (p>.05) for range or presentation order. It would appear latency responses across the four stimulus octave ranges did not differ significantly from each other, however trending data shows faster response time in all ranges for graduate students. Strong trending data, albeit non-significant, was also evident for responses between deviations: F (2,70) = 3.03, p=.055. There appears to be slight differences between responses to sharp, in-tune, and flat stimulus items. A significant interaction, F (2,70) = 3.281, p<.05, ηp2=.09, was evident between the degree factor and deviation level. Graduate students, while having overall faster response times to intonation trials, did not respond to the flat trials at the same rate as sharp or in-tune trials. A Friedman’s test was utilized to investigate potential differences between numbers of correct responses for each of three deviations and each octave range. When comparing number of correct responses between deviations of flat, sharp, and in-tune, a significant difference was found between responses: χ² (2, N=52) = 8.13, p<.05. Pairwise comparisons were evaluated and the number of accurate responses to sharp stimuli was significantly lower than in-tune stimuli (p<.05) and all other pairs were non-significant (p>.05.) Comparing responses between octaves, a significant difference was found, χ² (3, N=52) = 8.28, p<.05. Pairwise comparisons were evaluated and the data indicates accurate responses to bass stimuli were significantly lower in number than alto or tenor ranges (p<.05.) The first research objective looked at numbers of accurate responses between octaves. Analysis of the data indicated that participants were less accurate when responding to bass stimuli than either alto or tenor stimuli. The second and third research objectives utilized response time, measured in milliseconds, to evaluate responses across all four octaves. While no significant differences were found between each range and deviation, strong trends were evident. When the level of education experience was taken into account, graduate students seemed to outperform undergraduate students as evidenced by quicker response times in each octave. This is consistent with prior research in which age, training, and ensemble experience improves pitch perception. The final research objective sought to determine if response time measures might function as a valid tool in measuring pitch perception. The results of this study, which exhibited several corroborations with previous research, indicate that response time measures may yield similar results and therefore may be a valid tool.

Schlegel, Amanda. University of Southern Mississippi, Hattiesburg. **Manipulation of Attention While Listening on Undergraduate Music Majors’ Error Detection in Homophonic and Polyphonic Excerpts: A Pilot Study**

In the extant research in music performance error detection, the influence of musical context has been thoroughly examined. Issues such as timbre, number of parts, texture, tonality, error location, and error type have all been prominent variables in a variety of studies. The issue regarding texture, specifically
homophony and polyphony, may influence one’s abilities to attend to the music, a topic discussed by many (Crawley, Acker-Mills, Pastore, & Weil, 2002; Schlegel, 2010; Sloboda, 1985).

In this study, I attempt to add to the literature investigating how manipulating attention while listen may affect detection of errors in polyphonic and homophonic excerpts. While attention may be adjusted during score study to isolate one particular part (Schlegel, 2010), perhaps adjusting how one attends to and listen to music while assessing its accuracy should be influenced by the musical context itself, specifically texture.

Participants (N = 25) were undergraduate instrumental music education majors enrolled in an undergraduate secondary methods course during spring semesters of 2012 and 2013. All of these students had successfully completed the undergraduate theory sequence and at least one course in conducting. These participants were tasked with detecting pitch and rhythm errors inserted into three-part homophonic and polyphonic excerpts. A total of four errors were inserted into each of the six excerpts for a total of 24 errors.

Before error detection, all participants experienced a familiarization phase in which they heard a correct full (all three voices at once) performance, followed by each individual voice, and one final opportunity to listen to the full excerpt again. Participants then heard a flawed performance containing pitch and rhythm errors with their task being to detect the errors. All participants were familiarized with the music with this procedure. Two treatment experiences were created in order to investigate the effects of attention manipulation while listening. Following the familiarization phase, participants in the wholistic listening group (n = 13) were instructed to attend/listen to all voices while listening. They were instructed that listening in this way would result in detecting the most errors. Participants in the selective listening group (n = 12) were instructed to attend/listen to individual voices while listening. Participants heard the flawed performance twice, which meant they could not focus on one voice hearing and used different colored pens (blue then red) as means of indicating the order in which errors were detected. A practice excerpt was used to orient participants the experimental procedures and acoustic conditions of the room. All excerpts were electronically generated in Finale and all instructions were recorded. These treatments were specifically designed to investigate the hypothesis that polyphony, characterized by rhythmic independence and asynchrony across voices, may necessitate selection of an individual to listen/attend to. Sloboda (1985) suggested that the ability to listen to and follow all voices in polyphonic music is only possible when one is very familiar with each individual voice. In contrast, a perceptual fusion may occur when listening to homophonic music, which is typically dominated by a sameness of rhythm, a vertical synchrony, where all voices move together.

Data analysis will be conducted to determine if there are significant main effects due to treatment group, error type, texture, or voice location. Additional analysis will be conducted to determine if more errors are detected in the first hearing in comparison to the second and if there are any interactions with treatment group or error type. An item analysis will be conducted to determine item difficulty and discrimination values (point-bi-serial correlation) for each of the errors.
It is now well known that the refinement and enhancement of newly acquired motor skills may continue long after active practice has ended, absent the conscious attention of the learner. This process, called memory consolidation, first stabilizes memories in the hours following initial practice of novel motor skills (Walker, Brakefield, Hobson, & Stickgold, 2003a), then enhances memories during overnight sleep, often resulting in observable enhancements in performance the following day (for a review, see Walker, 2005).

The effects of much shorter periods of wakeful rest have also been demonstrated in motor skill research. Short-term boosts in performance following brief rests have long been observed and described as the phenomenon labeled reminiscence, but they were reported as transient, as learners’ skill levels quickly returned to performance levels obtained before the rest. In two recent experiments, though, nonmusicians who learned a finger-tapping task (Cash, 2009) and musicians who practiced novel music skills (Duke, Allen, Cash, & Simmons, 2009) were the first to demonstrate performance boosts that persisted across practice. Surprisingly, these learners were most advantaged by the interposition of brief rest breaks early in practice (after only 3 min of practice), such that by the end of practice, learners given an early rest break outperformed those who did not rest and those who rested later during practice (after 9 min), and also showed greater consolidation-based skill enhancement following a night of sleep.

Although both studies suggest that early breaks in practice advantage both nonmusicians and musicians, there are considerable differences between these two investigations. Specifically, nonmusicians learned a finger-tapping task that differed in complexity as compared to the task musicians practiced. Musicians learned a 13-note piano melody while listening to the sound of the piano; nonmusicians learned a 5-keypress sequence on the piano with the sound turned off. To date, there has been no systematic investigation that directly compares motor skill acquisition and retention between these two populations of learners. It seems reasonable to suggest, though, that some domain-specific elements of formal music training (e.g., years of individual practice coordinating the motor and sensory systems) may advantage musicians in novel skill learning contexts. We have begun an investigation that will directly compare musicians’ and nonmusicians’ acquisition of a new simple motor skill during active practice, specifically attending to performance changes that are observable following brief intervals of rest interposed early in practice, and after an interval of memory consolidation that includes sleep. As part of the sleep-consolidation component of this study, we would also like to explore the role of sleep in the development of performance skill more deeply than has been possible heretofore. To that end, we have initiated a collaboration with the Sleep Lab in the Department of Respiratory Care, College of Health Professions, at XXXXX University. With the help of a consultant, we will collect sleep actigraphy data, which will allow us to explore whether a relationship exists between sleep quality and observable performance changes.

The purpose of this investigation will be: 1) to determine whether formal music performance training primes the motor system of musicians in ways that advantage their acquisition and retention of a simple motor task as compared to nonmusicians; 2) to discover how the preliminary stages of memory consolidation that begin during active practice may be affected by the content of rest breaks; and 3) to explore the relationship between sleep quality and the extent to which motor skill memories are acquired and subsequently modified.

Stephens, Gaile. Emporia State University, KS. Singing Perceptions: An Investigation of Construct Validity and Predictors
The purpose of this study is to investigate predictors of mid-west college music major and non-music majors’ relationship to singing while verifying the construct validity of the term singing perceptions. A revised version of the researcher-created Singing Perception and Participation survey will be piloted (N =30). Then the survey will be used to collect information about the singing perceptions of university students in music and in other majors (N = 200). A factor analysis will be run to determine the construct of singing perceptions. The independent variables of home environment, music learning environment, social comparisons, age, gender, ethnicity, college major, and singing experiences will be tested using a linear multiple regression to determine predictors of students’ singing perceptions. The common levels of singing participation will be reported as frequency counts. Finally, open response items will be examined to explore reasons given by individuals for their perceptions regarding singing. It is hoped that this study will verify the findings of a previous study conducted on singing perceptions, but with non-music majors in the southeast United States. The previous study found home environment and music learning environment to be the only statistically significant predictors of singing perceptions. The inclusion of music majors to this study will help determine if having more musicians in the sample results in additional predictors. Furthermore, based on the research literature, the originally proposed construct of individual’s relationship to singing focused on singing as a broad term. Three sub-categories were originally identified: efficacy, singing identity, and singing attitudes. The first edition of the Singing Perception and Participation survey had good validity and reliability scores, but the factor analysis revealed it only measured two factors of singing perceptions: singing self-efficacy and singing attitudes. In post-study examination of the original measure, the number of items representing singing identity were found to be unbalanced in comparison to the other factors.

Therefore, a revised Singing Perception and Participation survey will be created with equally balanced items representing singing self-efficacy, singing attitudes, and singing identity. The results of this study will determine the construct validity of singing perceptions as a two or three factor construct. The remaining items will also check for similarities to the results of the previous study on singing perceptions including predictors of singing perceptions and open responses from participants.

Waymire, Mark. University of Southern Mississippi, Hattiesburg. The Effects of Visual Stimuli on the Cognition of Art Music Selections by Non-Music Major Students in a University Music Appreciation Class

Based on studies done by Geringer (1996,1997), the purpose of this study was to examine if visual stimuli would affect cognition of art music selections presented in a non-music major music appreciation classroom. One hundred sixty students were selected for the study at a large university in the southeast. Group 1 received lecture on four art-music pieces accompanied by audio recordings and various visual stimuli that utilized the music for visual interpretation in a programmatic or abstract design. Group 2 received lecture on the same four art-music selections accompanied by audio recordings. After each piece was presented, all participants were given a 15-question exam that asked for identification of the following items: composer name, title of selection, time period, country of origin, ensemble type, form, timbre, textures, dynamic use, tempo use, rhythm use, meter use, use of melody, use of dissonance, and tonality. Comparison of test scores revealed no significant difference between students exposed to the visual stimuli compared to students exposed to audio stimuli exclusively.

Choral conductors often end a piece with a grand gesture. This flourish frequently ends with a fisted gesture at the release. The final moment may be visually appealing for the performers and audience, however, the effect of this type of “cutoff” on the vocal production of the singers is unclear. Such a question may be of interest because of the human tendency to mimic one another. Human beings have been shown to imitate one another in a variety of situations and in a variety of ways. Among the scores of studies on the topic, research participants have imitated various gestures (Chartrand & Bargh, 1999), postures (LaFrance 1979; LaFrance & Broadbent, 1976; Maurer & Tindall, 1983; Schefflen, 1964) facial muscular activity (Dimberg, Thunberg, & Elmehed, 2000), and arm tension (Berger & Hadley, 1975). Research has also suggested that the tendency to imitate others may begin nearly immediately after birth (Meltzoff & Prinz, 2002). In some cases, these responses have appeared to happen on a non-conscious level.

Despite these findings, there have been few studies in conducting pedagogy that have investigated these phenomena. Two studies have found that participants imitated a modeled /u/ vowel by the conductor, in many cases without awareness of the stimulus (Daugherty & Brunkan, 2013; Manternach, 2012). Participants have also seemed to imitate upward head and shoulder movements by a conductor during preparatory gestures (Manternach, 2011). Fewer studies still have investigated the possible effects that conductor hand gestures might have on singers’ sound. In a series of studies, participants perceived that fisted or stabbing left hand crescendo gestures might evoke more inappropriate tension than other left hand crescendo gestures (Fuelberth, 2003a, 2003b, 2004). In another study of preparatory gestures (Manternach, 2012), surface electromyographic readings seemed to indicate slight increases in singer sternocleidomastoid muscle activity during singer inhalation that occurred with a conductor fisted gesture. No investigation to date, however, has studied the effects of a conductor fisted gesture during a final release or “cutoff” gesture.

The purpose of this pilot study was to investigate possible differences in perceptions of individual singers’ vocal sound during a final release when cued by conductor fisted or open palm inhalation gestures. To that end, the following research questions guided the investigation: (a) Will a listening panel report differences in individual singers’ vocal sound during two conductor final release gestures (fisted gesture and open palm inhalation gesture)? (b) Will singers report differences in the conductor gestures, their own vocal sound, or their own vocal production during the final release gestures? Singers wore a head-mounted microphone (AKG C520) that was positioned 7 cm from the corner of their mouths. The microphone connected to a Sound Devices USB Pre2 pre-amplifier, which then connected to a Dell Inspiron 7520 (Intel Core i7, 64-bit operating system, 2.2 GHz, 8 GB RAM) that recorded using Adobe Audition CS6). They then sang a short melody that ended on a vowel sound while watching a life-sized projection of a conductor. The conductor gave the same preparatory gesture each time and conducted in a traditional four beat pattern throughout the duration of the melody. On each repetition’s final note, the conductor displayed the same palm up sustaining gesture prior to the final release. The two final release gestures were (a) vigorous fisted gesture and (b) open palm inhalation gesture. Each participant viewed the two gestures one time each in a randomized order. The open palm inhalation gesture moved up from the sustaining gesture and dropped again to the conducting plane. Upon returning to the plane, the conductor breathed and allowed his hand to rebound upward as if cueing inhalation. For the fisted gesture, the conductor moved up from the sustaining gesture in the same way. He then returned to the conducting plane and stopped there with a vigorous fist. He did not display an inhalation on this release gesture.
Following the recorded trials, judges listened to the paired trials and judged them for differences in vocal sound on the final release using a visual analog scale (VAS). Using the same computer and pre-amplifier, they listened to the examples using an AKG k240 studio headphones (55 ohms impedance). Listeners evaluated both trials from each participant, which were played in the same random ordering that the singers experienced.

Singer participants also responded to a follow-up questionnaire that asked them to identify any differences in the conductor behaviors. Additionally, they could report whether such differences may have affected their vocal sound and vocal production. N.B. Results have not yet been analyzed.